Explosion Lab (complete on back of handout)

Objective:

To explore conservation of momentum in an "explosion" of 2 carts springing apart.

Hypothesis/Background Theory:

Momentum is conserved in a closed, isolated system. Is the system likely to be isolated?

$p=mv \quad \Sigma P_i = \Sigma P_f$

Procedure:

Cart "explosion"

1. In groups of 3 or 4, take out two wooden carts, a force scale that reads to 20 N, 2 metre sticks, 2 timing devices and 2 1kg masses. Place textbooks to stop the carts from rolling off the table but allow them to roll a full metre.
2. Weigh one cart using the zeroed force scale DO NOT PUT THEM ON THE ELECTRONIC BALANCE, calculate and record M1. Then do the same with the second cart and record as M2. Use the table on the back of the sheet.
   Note that
   M1- the mass of cart 1, it should be constant,
   M2 the mass of cart 2 + weights, varies with each explosion
   D1 and D2 the distance timed for carts 1 and 2. Can be constant.
   3 trials of T1 and T2, the time for carts 1 and 2 to travel the distance. Average the times. If one data set is way out, do not use for calculating average.
3. Set the two carts with the spring side facing each other, beside the two rulers
4. Prepare 2 stopwatches for the 2 carts
5. Push the carts together so that the springs are compressed and line up the metre sticks.
6. Start the timer the moment you let go of both of the carts
7. Stop the timers when the carts travel a set distance, try 1.00 m. If 1.00 m gives you reasonable results, record it under D1 and D2. If not, change the distance and try again.
8. Record the time for the 2 carts on your chart under T1 and T2. Complete 3 trials and average the values.
9. Add a kg mass on cart 2 and repeat the procedure.

Analysis

Compare the total momentum of the system before and after the explosion. (hint: if the initial velocity is 0, what is the initial momentum?) To calculate the percent error, take the difference in the momenta before and after, and divide by the average magnitudes of the momenta (add them without including direction). Show your work. Include units.

Conclusion

Does the data support your hypothesis/background theory? How close is it?

Sources of Uncertainty

How do you explain your deviation from theory? What data supports your claims?

Name_____Block_____

Explosion	1 (no extra mass)	2 (1kg extra on cart 2)	3(2kg extra on cart 2)
Mass of cart 1 (kg) $M=F_g/9{,}8N/kg$		Same	Same
Mass of cart 2 (kg)			
Displacement of cart 1 (m)			
Displacement of cart 2 (m) – set as negative			
Time for cart 1 to travel that distance (s)	Trial1		
	2		
	3		
	avg		
Time for cart 2 to travel that distance (s)	1		
	2		
	3		
	avg		
Calculate the momentum of cart 1 $p=mxd/t_{avg}$			
Calculate the momentum of cart 2 $p=mxd/t_{avg}$			
Calculate the total momentum of the system after the explosion (remember, p2 is negative)			
Calculate the % error (Change in p of the sytem)/ (absolute value of p2+p1) X 100%			

Conclusion: (how closely does the data support the hypothesis?)

Sources of Uncertainty: (give evidence from your data and estimate quantities)